UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/821,175	04/09/2004	Toru Noguchi	101074.53980US	8408

25944 7590 08/14/2009

OLIFF & BERRIDGE, PLC
P.O. BOX 320850
ALEXANDRIA, VA 22320-4850

EXAMINER	
COLE, ELIZABETH M	
ART UNIT	PAPER NUMBER
1794	

MAIL DATE	DELIVERY MODE
08/14/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/821,175	NOGUCHI ET AL.	
	Examiner	Art Unit	
	Elizabeth M. Cole	1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 May 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,6-24 and 26-29* is/are pending in the application.

4a) Of the above claim(s) *11-22* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,6-10,23,24 and 26-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *5/11/09; 3/3./09*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-4, 6-10, 23-24, 26-29, rejected under 35 U.S.C. 103(a) as being unpatentable over WO 03/06002 in view of Brennan et al, U.S. Patent No. 5,844,523. WO '002 discloses a material comprising an elastomer such as natural rubber, synthetic rubbers based on diene polymers such as polybutadiene, styrene-butadiene, polyisoprene rubber, etc., nitrile rubber, silicone rubber, neoprene rubber, urethane rubber, etc. See page 4, lines 19-26. WO '002 teaches that carbon nanotubes can be mixed with the elastomer. Since the elastomers disclosed comprise an unsaturated bond or group, the elastomers would necessarily have the claimed affinity to the carbon nanofibers and the claimed molecular weights. WO '002 does not disclose the claimed spin-spin relaxation time of the network components as measured by the Hahn-echo method using pulsed NMR techniques, however, since the same materials are employed and the same results are obtained, it is reasonable to presume that the materials of WO '002 would have the claimed spin-spin relaxation time. WO '002 teaches the addition of surfactants in order to provide for uniform distribution of the carbon nanotubes in the rubber. See page 5. WO '002 teaches the same elastomeric materials having the same unsaturated bond groups and teaches that the carbon nanotubes have an affinity for the elastomers. See page 5. Thus, WO '002 teaches elastomers in which carbon nanotubes are uniformly distributed. Thus, it is reasonable

to expect that the thus formed composite material comprising the elastomer and uniformly distributed carbon nanofibers would possess the claimed spin-spin relaxation times as measured by the Hahn echo method using pulsed NMR. WO '002 does not state that the elastomer should be crosslinked or uncrosslinked. However, WO '002's examples include vulcanized, (i.e., crosslinked) elastomers. Brennan et al teaches that elastomers such as rubbers into which filler such as fibers can be dispersed can be either crosslinked or uncrosslinked. See col. 7, line 65 – col. 8, line 10. Therefore, since WO'002 is silent as to whether crosslinked or uncrosslinked elastomers are employed and Brennan teaches that both crosslinked and uncrosslinked elastomers are suitable for use to form composite materials into which fillers such as fibers are mixed, one of ordinary skill in the art at the time the invention was made would have been motivated to have employed either crosslinked or uncrosslinked elastomers as the elastomer resin component taught by WO '002 because Brennan et al teaches that both types of elastomers can be used in such composite materials.

3. Claims 1-4, 6-10, 23-24, 26-29 are rejected under 35 U.S.C. 103(a) as obvious over Fisher et al, U.S. Patent No. 6,203,814 in view of Brennan et al, U.S. Patent NO. 5,844,523. Fisher discloses a composite material comprising carbon nanofibers having a diameter of less than 0.5u, (col. 4, lines 45-46), which can be dispersed in an elastomer such as natural rubber, styrene-butadiene rubber or polybutadiene, (col. 7, lines 1-9). Since the elastomers disclosed comprise an unsaturated bond or group, the elastomers would necessarily have the claimed affinity to the carbon nanofibers and the claimed molecular weights. Fisher discloses that there is an affinity between the

nanofibers and the elastomers. See abstract. Fisher does not disclose the claimed spin-spin relaxation time of the network components as measured by the Hahn-echo method using pulsed NMR techniques, however, since the same materials are employed and the same results are obtained, it is reasonable to presume that the materials of Fisher would have the claimed spin-spin relaxation time. Also, Fisher teaches that the functionalized carbon fibrils are better dispersed into polymer systems, including elastomers, in theory, because the modified surface properties of the fibrils are more compatible with the polymer, or because the modified functional groups, particularly hydroxyl or amine groups are bonded directly to the polymer as terminal groups. Specifically, Fischer states at col. 7, lines 10-18, that "without being bound to a particular theory, the functionalized fibrils are better dispersed into polymer systems because the modified surface properties are more compatible with the polymer, or because the modified functional group (particularly hydroxyl or amine groups) are bonded directly to the polymer as terminal groups. In this way, polymer systems such as polycarbonates, polyurethanes, polyester or polyamides/imides bond directly tot eh fibrils making the fibrils easier to disperse with improved adherence". Therefore, it would have been obvious to have selected the functional groups which produced the best dispersion of the functionalized fibrils into the polymer system as taught by Fisher. The elastomer is not disclosed as being crosslinked or uncrosslinked, but instead the reference is silent as to this feature. Brennan et al teaches that elastomers such as rubbers into which filler such as fibers can be dispersed can be either crosslinked or uncrosslinked. See col. 7, line 65 – col. 8, line 10. Therefore, since Fisher et al is

silent as to whether crosslinked or uncrosslinked elastomers are employed and Brennan teaches that both crosslinked and uncrosslinked elastomers are suitable for use to form composite materials into which fillers such as fibers are mixed, one of ordinary skill in the art at the time the invention was made would have been motivated to have employed either crosslinked or uncrosslinked elastomers as the elastomer resin component taught by Fisher et al because Brennan et al teaches that both types of elastomers can be used in such composite materials. With regard to the amendment reciting that the fibers are substantially uniformly dispersed, Fisher teaches at col. 7, lines 10-18 that carbon fibers are easily dispersed in the elastomer composition.

4. The Declaration under 37 CFR 1.132 filed 5/11/09 is insufficient to overcome the rejection of claims based upon WO 03/06002 in view of Brennan et al, U.S. Patent No. 5,844,523 and Fisher et al, U.S. Patent No. 6,203,814 in view of Brennan et al, U.S. Patent NO. 5,844,523as set forth in the last Office action because: of the reasons set forth in paragraph 6 below.

5. Applicant's arguments filed 5/11/09 have been fully considered but they are not persuasive.

6. Applicant argues that the Declaration under 37 CFR 1.132 filed 5/11/09 establishes that the method of mixing changes the spin spin relaxation time and that therefore the claimed spin spin relaxation times would not necessarily be inherently present. However, initially, it is noted that the instant specification states that with regard to the method of dispersing the carbon nanofiber into the elastomer and mixing them, that “it is only required in this step to apply shear force sufficient to separate the

aggregated fibrils of the carbon nanofiber to the elastomer" and that the method of dispersing and mixing is not limited to an open-roll method. Thus, while the declaration appears to show that the method of mixing does have an effect on the spin spin relaxation time, it is noted that the instant claims do not recite a particular method of mixing and that the instant specification does not teach that any method of mixing is required or critical in order to obtain the claimed spin spin relaxation time. Further, with regard to the relationship between the spin spin relaxation time and the method of mixing, it would be expected that since the spin spin relaxation time is measuring how well dispersed the carbon nanofibers are dispersed in the elastomer, that the different methods of mixing would produce some difference in the spin spin relaxation time, depending on how effective the mixing method was in forming a well dispersed composite comprising the carbon nanofibers in the elastomer. The response dated 7/31/06 at page 9, third full paragraph states that the spin spin relaxation T2n as claimed is an indication that in the recited composite materials, the carbon nanofibers are homogeneously dispersed. Thus, it has been established that the spin spin relaxation times claimed are a measure of the homogeneity of the dispersion of the carbon nanofibers in the composite material. WO '002 discloses a composite material comprising carbon nanofibers wherein the carbon nanofibers have been treated with surfactants to produce uniform distribution of the carbon nanofibers in the elastomer. See page 5 of WO '005. A uniform distribution of the nanofibers in the elastomer is equated with homogeneously dispersed carbon nanofibers. Since the response of 7/31/06 equates homogeneously dispersed carbon nanofibers in the elastomer with the

spin spin relaxation times recited in the claims, there is a reasonable expectation that an elastomer comprising a uniform distribution of carbon nanofibers would have the claimed spin spin relaxation times. Therefore, the examiner has a reasonable basis for stating that on its face, the material of WO '002 appears to teach the same materials and would therefore on its face have the same properties of spin spin relaxation times as the claimed material. Similarly, with regard to Fisher, since Fisher teaches that the carbon nanofibers should be functionalized in order to improve their dispersaibilty in the resin matrix, it is reasonable to expect that once the best combination of functionalized carbon nanofibers and resin which produced the best dispersion was obtained while working within the parameters taught by Fisher, the resulting composite material would have the claimed spin spin relaxation times.

7. Applicant argues that none of the applied reference disclose that it is desirable to produce a material having the recited spin spin relaxation time. However, the references do teach the desirability of a uniform dispersion of the carbon nanofibers in the matrix. The spin spin relaxation time is a measure of the uniformity of the dispersion of the carbon nanofibers. Thus, while the references do not discuss spin spin relaxation time per se, they do discuss the uniformity of the dispersion of the carbon nanofibers, which is what the spin spin relaxation time measures.

8. Applicant argues that the Bokobza reference shows that Fisher does not achieve a uniform dispersion of the nanofibers, because Bokobza states that chemical functionalization was successful in epoxy matrices but that poor dispersion continues to limit the full utilization of carbon nanotubes for reinforcing polymeric media. However,

the Bokobza reference does not discuss that functionalizing is not successful in elastomers and in the conclusion section states that "Poor dispersion and lack of interfacial adhesion between the tubes and the polymer are limiting factors for full realization of filler capability. Up to now, the improvements in mechanical properties of the neat polymer by carbon nanotube incorporation remain modest with regard to what should be expected from a nanometer-scale reinforcement. This demonstrates the need for optimizing the processing conditions to achieve good dispersion and good interaction with the polymer chains. This could be done by an appropriate fucntionalization of the tube surface or by introducing in the medium a type of coupling agent able to react with both phases". Thus, Bokobza does not dismiss functionalization as failed but instead states that functionalization, (which is what is taught by Fisher), can be used to improve dispersion and thus improve the properties of the composite material.

9. Applicant argues that Kim does not teach uniform dispersion but instead teaches more uniform dispersion. However, WO '002, (which Applicant refers to as Kim), states that the "... role of surfactants is [also] advantageous in uniformly distribution carbon nanotubes or GNF in rubber. Further, as noted by Applicant, WO '002 also states that the surfactant is chosen so that they distribute carbon nanotubes or GNF uniformly in the rubber. Therefore, WO '002 teaches employing the surfactant to uniformly distribute the nanofibers in the elastomer. While Applicant argues that WO '002 does not provide an enabling disclosure of how to achieve the uniform distribution, WO '002 teaches that in order to provide the uniform dispersion that a surfactant should be used.

10. With regard to the previous Declaration under 1.132 filed August 25, 2008, Applicant requests clarification regarding hypothetical times before the invention was made and requests clarification of form paragraph 7-66-04. Form paragraph 7-66-04 sets forth the interpretation of MPEP 716.04 in setting forth the requirements that the declaration needs to show. As previously noted, the Declaration states that there was a long felt need, but does not present evidence to support this. Further, the Declaration does not establish how long others of ordinary skill in the art were working on the problem other than saying there had been repeated attempts. The Declaration does not present evidence that if person skill in the art who were presumably working on the problem knew of the teachings of Fisher and the newly cited WO '002 reference that they would still be unable to solve the problem. This is the standard set forth in MPEP '716.04 as interpreted in form paragraph 7-66-04. It is noted that with regard to the requirement set forth in form paragraph 7-66-04 that in establishing long felt need, it is necessary to show that the long felt need must not have been satisfied by another before the invention by applicant, (see MPEP 716.04). Thus, it is necessary to show that if a person skilled in the art knew of the teachings of Fisher and WO '002 that they would still be unable to solve the problem, in that it appears that Fisher and WO '002 solve the problem by providing a uniform dispersion or an improved dispersion of the carbon nanofiber. In the instant case, as set forth above, there is a reasonable basis for the expectation that the uniform dispersion of WO '002 and the improved dispersion of Fisher satisfies the need for a well dispersed carbon nanofiber in an elastomer. Specifically, the claimed spin spin relaxation times have been equated with a

homogeneous dispersion of the nanofibers on the record multiple times. WO '002 teaches a uniform dispersion and Fisher teaches an improved dispersion of the nanofibers. Thus, it is reasonable to expect that the long felt need of a homogenous dispersion of nanofibers has been solved by teachings of the applied art references. There is nothing on the record showing that if the person skilled in the art was aware of the references that they would still not be able to solve the problem, since those references on their face provide a reasonable basis for the belief that the problem had been solved and the long felt need has been satisfied.

11. Further, as noted in the previous action, with regard to the showing set forth in the Declaration of 8/25/08, the WO '002 reference teaches fiber amounts of 0.1-150% at page 6, lines 1-3. Therefore, it has not been established that high amounts of fibers were previously necessary to form the composite material. It is noted that establishing long-felt need requires objective evidence that an art recognized problem exited in the art of a long period of time without solution. There is no evidence presented establishing this. Further, no evidence has been presented of prior unsuccessful attempts to solve the problem, especially since it has not yet been established that there was an art recognized problem for a long period of time. Additionally, it must be established that no one else solved the problem before the applicant. In the instant case, Fisher discloses a composition wherein the carbon nanofibers are easily dispersed in the elastomer composition and WO '003 states that invention provides a method of achieving uniform distribution of the nanofibers in the elastomer composition, (see page 5). Further, other facts such as lack of interest or lack of an appreciation of

an invention's potential or marketability must be considered in determining the reasons for a failure to solve a long-felt need. The instant Declaration does not provide evidence as to these factors.

12. Applicant argues that the Bokobza reference establishes both long felt need and failure of others. However, while the Bokobza establishes that improving the uniformity of dispersion of nanofibers in a matrix was a concern in the art, it does not establish that other methods such as functionalizing the nanofibers were unsuccessful, but rather states that such methods can be used.

13. Therefore, based on the totality of the record, the rejection is maintained.

14. The Declaration filed 5/11/09 has been fully considered but is not persuasive for the reasons set forth in paragraph 5 above.

15. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Elizabeth M. Cole whose telephone number is (571) 272-1475. The examiner may be reached between 6:30 AM and 6:00 PM Monday through Wednesday, and 6:30 AM and 2 PM on Thursday.

The examiner's supervisor Rena Dye may be reached at (571) 272-3186.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

The fax number for all official faxes is (571) 273-8300.

/Elizabeth M. Cole/
Primary Examiner, Art Unit 1794

e.m.c